

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering *g42*
Washington, D.C. 20594

February 19, 2002

Flight Path Study - American Airlines Flight 11

A. SUBJECT AIRCRAFT

Location: New York City, NY
Date: September 11, 2001
Time: 08:47 AM Eastern Daylight Time
Flight: American Airlines Flight 11
Aircraft: Boeing 767
NTSB#: DCA01MA060

B. GROUP

N/A

C. SUMMARY

This document provides a brief description of the flight path of the aircraft based on information obtained from various sources of recorded radar of the subject aircraft both before and after the hijacking events. Flight paths are overlaid onto maps of the area, and time histories of altitude data are presented.

American Airlines Flight 11 – Flight Profile

The following profile of American Airlines Flight 11 is based on radar data obtained from the Federal Aviation Administration's Terminal and Air Route Traffic Control Centers, and from the U.S. Air Force 84th Radar Evaluation Squadron. Figure 1 shows the flight path of the aircraft from take off at Boston, MA to impact with the North tower of the World Trade Center in New York City. Figure 2 shows the aircraft's altitude profile for the 1 hour and 47 minute duration of the flight.

American Flight 11 took off from runway 4R at Boston's Logan Airport at approximately 8:00 AM (point A in Figures 1 and 2) and made a right turn to the West in response to ATC instructions. At 8:11 AM the airplane was passing through 21,500 ft. on a Westerly

heading, climbing at about 1,900 ft./minute to its initially assigned altitude of 29,000 ft. At 8:13:29, while passing through 26,000 ft., Boston Center instructed flight 11 to turn 20 degrees to the right. The crew acknowledged, and radar data shows a corresponding change in heading. Within the same minute, at 8:13:47 (point B), Boston Center instructed flight 11 to climb and maintain 35,000 ft. The crew never acknowledged this instruction, and over the next ten minutes the controller made numerous unsuccessful attempts to contact flight 11. At 8:24:38 an unknown voice was recorded on the ATC radio frequency stating "we have some planes just stay quiet and you'll be okay we are returning to the airport."

At about 8:16 AM (point C), radar data shows Flight 11 leveling off at 29,000 ft., the last assigned altitude acknowledged by the flight crew. At about 8:21 (point D) radar stations stop receiving transponder returns from the airplane. Since the transponder broadcasts the airplane's altitude to the radar station, precise information about the airplane's altitude is lost at this point. However, long range radar data obtained from the USAF includes (less precise) altitude information based on primary radar returns, and indicates that at about the same time the transponder returns ceased the airplane started a 1,500 ft. climb to 30,400 ft. The airplane maintained this altitude and the Northwest heading until about 8:26:30 (point E). At this point, the airplane made a level, left turn to the South. About a minute later it turned right to the South-Southwest, and about 2 minutes after that (at 8:29:30) it turned left to the South-Southeast (point F). At about 8:32 the airplane descended back to 29,000 ft., where it stayed until about 8:37:30 (point G). The airplane then started a descent at an average rate of about 3,200 feet/minute. About half a minute later while descending through 28,000 feet, flight 11 turned left to a more Southerly heading towards New York City.

At about 8:43:30 and 10,000 feet, the airplane made another left turn to the South-Southwest, its final heading for the World Trade Center (point H). The airplane impacted the North tower at approximately 8:46:40 (point I).

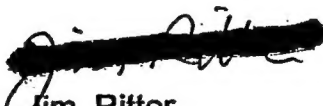

Jim Ritter
Chief, Vehicle Performance Division
NTSB

Figure 1. AA-11 Radar Ground Track

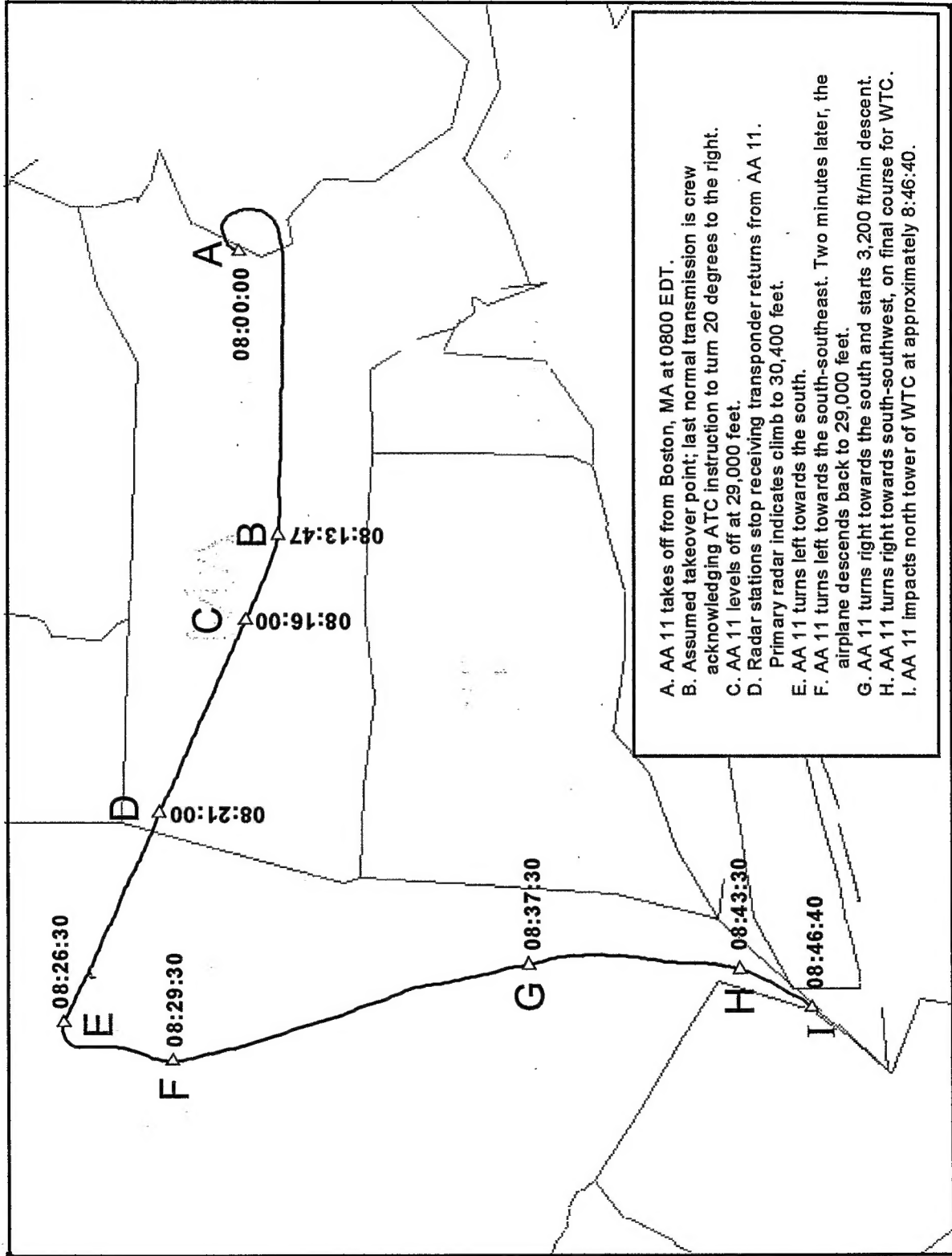
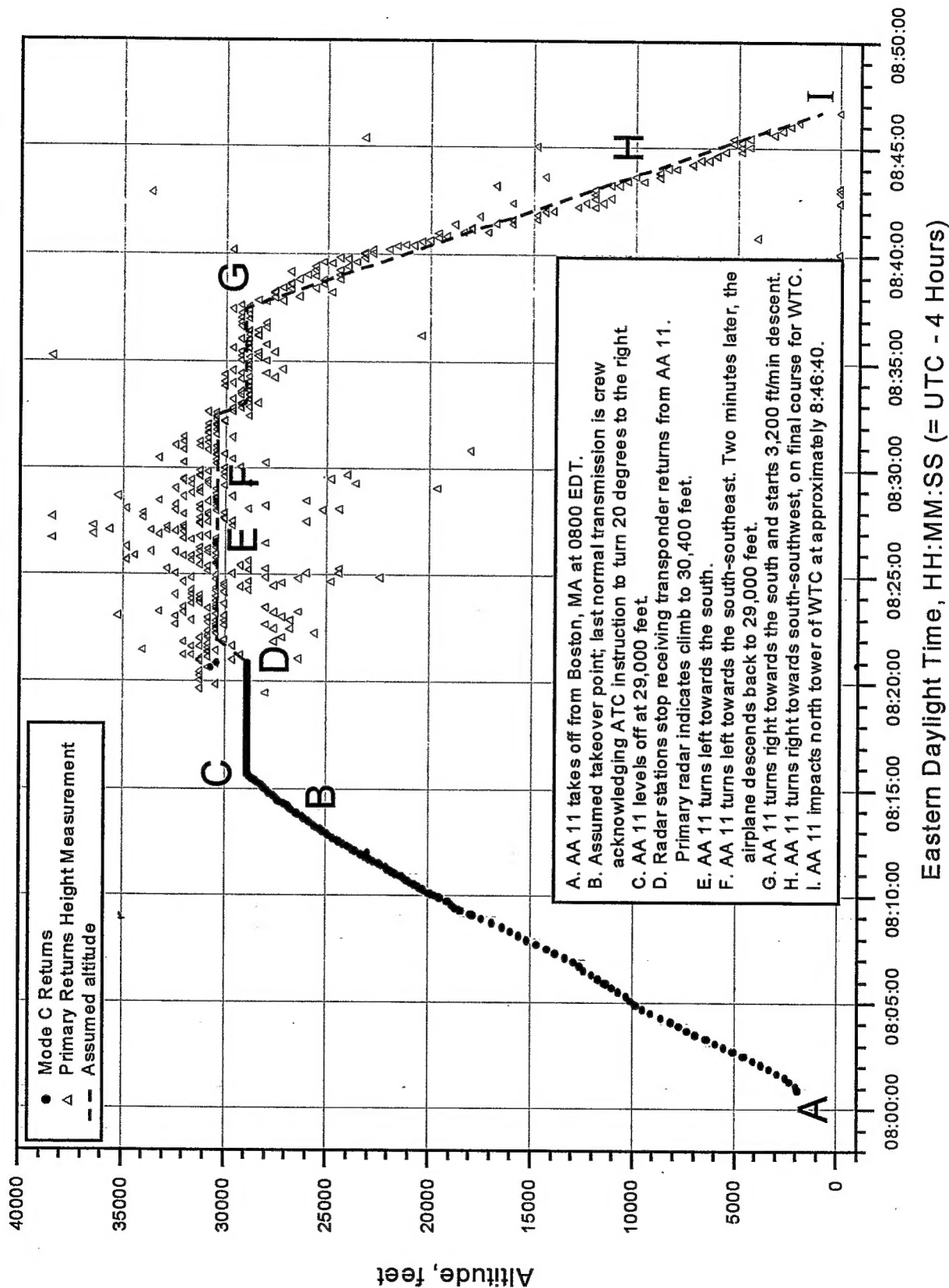


Figure 2. AA-11 Altitude Profile



Radio Communications with AA11

[Compiled from FAA Transcripts, each source shown in brackets]

7:59:02 LCE American eleven heavy traffic's orbiting north of the field at thirty five hundred feet maintain three thousand runway four right, cleared for takeoff. [BOS 11:52-1217 LCE]

7:59:11 AAL-11 maintain three cleared for takeoff on four right. what are the winds? [BOS 11:52-1217 LCE]

7:59:14 LCE wind three three zero at niner. [BOS 11:52-1217 LCE]

7:59:16 AAL-11 ***. [BOS 11:52-1217 LCE]

8:00:11 LCE American eleven heavy contact departure that traffic's now in your ten o'clock and two miles thirty four hundred feet. [BOS 11:52-1217 LCE]

8:00:19 AAL-11 * we have him in sight and going to departure so long American eleven heavy. [BOS 11:52-1217 LCE]

8:00:30 AAL-11 departure good morning American eleven heavy with you passing through ah two thousand for three thousand. [BOS 11:55-1210 Initial Dept.]

8:00:36 ID (B) American eleven heavy Boston departure radar contact good morning traffic ten o'clock two miles maneuvering Cessna Skylane VFR at three thousand five hundred. [BOS 11:55-1210 Initial Dept.]

8:00:43 AAL-11 we have him in sight American eleven. [BOS 11:55-1210 Initial Dept.]

8:01:19 ID (B) American eleven heavy climb and maintain eight thousand. [BOS 11:55-1210 Initial Dept.]

8:01:21 AAL-11 eight thousand American eleven heavy. [BOS 11:55-1210 Initial Dept.]

8:02:14 ID (B) American eleven heavy turn right heading one eight zero. [BOS 11:55-1210 Initial Dept.]

8:02:16 AAL-11 one eighty American eleven heavy. [BOS 11:55-1210 Initial Dept.]

8:03:03 ID (B) American eleven heavy climb and maintain one four thousand. [BOS 11:55-1210 Initial Dept.]

8:03:06 AAL-11 one four thousand American eleven heavy. [BOS 11:55-1210 Initial Dept.]

8:03:34 ID (B) American eleven heavy turn right heading two two zero. [BOS 11:55-1210 Initial Dept.]

8:03:37 AAL-11 two zero American eleven. [BOS 11:55-1210 Initial Dept.]

8:04:27 ID (B) American eleven heavy turn right heading two seven zero contact Boston approach one two seven point two good day. [BOS 11:55-1210 Initial Dept.]

8:04:37 AAL-11 twenty seven two and two seventy American eleven so long. [BOS 11:55-1210 Initial Dept.]

8:04:48 AAL-11 American eleven heavy with you passing through one zero thousand for one four thousand. [BOS 11:57-1210 Lincoln Dept.]

8:04:52 SL American eleven heavy Boston approach fly heading two seven zero. [BOS 11:57-1210 Lincoln Dept.]

8:04:55 AAL-11 * seventy American eleven. [BOS 11:57-1210 L-incoln Dept.]

8:05:14 SL American eleven heavy contact Boston center one three three point four two. [BOS 11:57-1210 Lincoln Dept.]

8:05:19 AAL-11 thirty three forty two so long American eleven. [BOS 11:57-1210 Lincoln Dept.]

8:05:32 AAL-11 Boston center good morning American eleven with you passing through one one thousand for one four thousand. [BOS 1207-1214 Sector 47R]

8:05:36 47R American eleven Boston center good morning climb maintain flight level two three zero proceed direct CHESTER. [BOS 1207-1214 Sector 47R]

8:05:41 AAL-11 two three zero direct CHESTER American eleven. [BOS 1207-1214 Sector 47R]

8:08:47 47R American eleven contact Boston center one two seven point eight two. [BOS 1207-1214 Sector 47R]

8:08:50 AAL-11 twenty seven eighty two so long American eleven. [BOS 1207-1214 Sector 47R]

8:09:17 AAL-11 Boston center good morning American eleven with you passing through one niner zero for two three zero. [BOS 1204-1233 Sector 46R]

8:09:22 46R American eleven Boston uh center roger climb and maintain level two eight zero. [BOS 1204-1233 Sector 46R]

8:09:25 AAL-11 two eight zero American eleven. [BOS 1204-1233 Sector 46R]

8:10:13 46R American eleven climb maintain flight level two niner zero. [BOS 1204-1233 Sector

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46R]
8:10:15 AAL-11 niner zero American eleven. [BOS 1204-1233 Sector 46R]
8:11:58 46R American eleven your traffic is at uh two o'clock two zero miles southwest bound MD-80 three one oh. [BOS 1204-1233 Sector 46R]
8:12:04 AAL-11 American eleven roger. [BOS 1204-1233 Sector 46R]
8:13:29 46R American eleven turn twenty degrees right. [BOS 1204-1233 Sector 46R]
8:13:31 AAL-11 twenty right American eleven. [BOS 1204-1233 Sector 46R]
8:13:47 46R American eleven climb maintain flight level three five zero. [BOS 1204-1233 Sector 46R]
8:13:57 46R American eleven climb maintain flight level three five zero. [BOS 1204-1233 Sector 46R]
8:14:08 46R American eleven Boston. [BOS 1204-1233 Sector 46R]
8:14:23 46R American eleven Boston. [BOS 1204-1233 Sector 46R]
8:14:33 46R American one one uh the American on the frequency how do you hear me? [BOS 1204-1233 Sector 46R]
8:15:15 46R American eleven Boston. [BOS 1204-1233 Sector 46R]
8:15:22 46R American eleven if you hear Boston center ident. [BOS 1204-1233 Sector 46R]
8:15:49 46R American eleven if you hear Boston center ident please or acknowledge. [BOS 1204-1233 Sector 46R]
8:16:32 46R American eleven if you hear Boston center ah re-contact Boston Center on one two seven point eight two, that's American eleven one two seven eight two. [BOS 1204-1233 Sector 46R]
8:17:05 46R American eleven, American one one Boston. [BOS 1204-1233 Sector 46R]
8:17:56 46R American eleven if you hear Boston center ident please. [BOS 1204-1233 Sector 46R]
8:18:56 46R American eleven Boston. [BOS 1204-1233 Sector 46R]
8:20:08 46R American eleven American one one how do you hear the center? [BOS 1204-1233 Sector 46R]
8:22:27 46R American eleven Boston. [BOS 1204-1233 Sector 46R]
8:24:33 46R is that American eleven trying to call? [BOS 1204-1233 Sector 46R]
8:24:36 AAL-11 **. [BOS 1204-1233 Sector 46R]
8:24:38 AAL-11 we have some planes. just stay quiet and you'll be okay we are returning to the airport. [BOS 1204-1233 Sector 46R]
8:24:46 46R and uh who's trying to call me here? [BOS 1204-1233 Sector 46R]
8:24:53 46R American eleven are you trying to call? [BOS 1204-1233 Sector 46R]
8:24:56 AAL-11 nobody move. everything will be okay. if you try to make any moves, you'll endanger yourself and the airplane. just stay quiet. [BOS 1204-1233 Sector 46R]
8:33:59 AAL-11 nobody move please we are going back to the airport don't try to make any stupid moves. [BOS 1204-1233 Sector 46R]